Diseases of Tobacco

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Diseases of Tobacco

- Damping Off - *Pythium aphanidermatum, P.debaryanum*
- Anthracnose - *Colletotrichum tabacum*
- Black Shank - *Phytophthora parasitica var. nicotianae*
- Powdery Mildew - *Erysiphe cichoracearum var nicotiane*
- Frog Eye Leaf Spot - *Cercospora nicotianae*
- Brown Spot - *Alternaria longipes, A. tenuis, A. alternate*
- Mosaic : Tobacco Mosaic Virus (TMV) (Mormor tabaci)
- Leaf Curl
- Orobanche-flowering parasite

Damping Off (*Pythium* spp.; *Rhizoctonia solani)*

Pythium spp. causes a watery, soft rot of the lower stem and root system and is more common during cool, wet weather.

Rhizoctonia causes brown, irregular cankers to develop on the lower stems and injury is more common during warm weather.
Lesions can enlarge and girdle the stem while plants that are not severely damaged by *Rhizoctonia* may recover in the field.

Management
Deep summer ploughing of nursery area
Raised nursery bed
Avoid overcrowding of seedlings by using reduced seed rate
Provide drainage facilities in nursery area
Spray drenching of seed bed with 0.2 % Ridomil MZ 72 WP


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Rhizoctonia damping-off, blight and rot (*Rhizoctonia solani*)

Tobacco Black shank – *Phytophthora parasitica* var *nicotinane*

Symptoms

Yellowing and a sudden wilt of all the leaves.

The root system will be black and rotting.

The lower portion of the pith of the stem will be blackened and classically the pith area will be divided into disks of tissue.

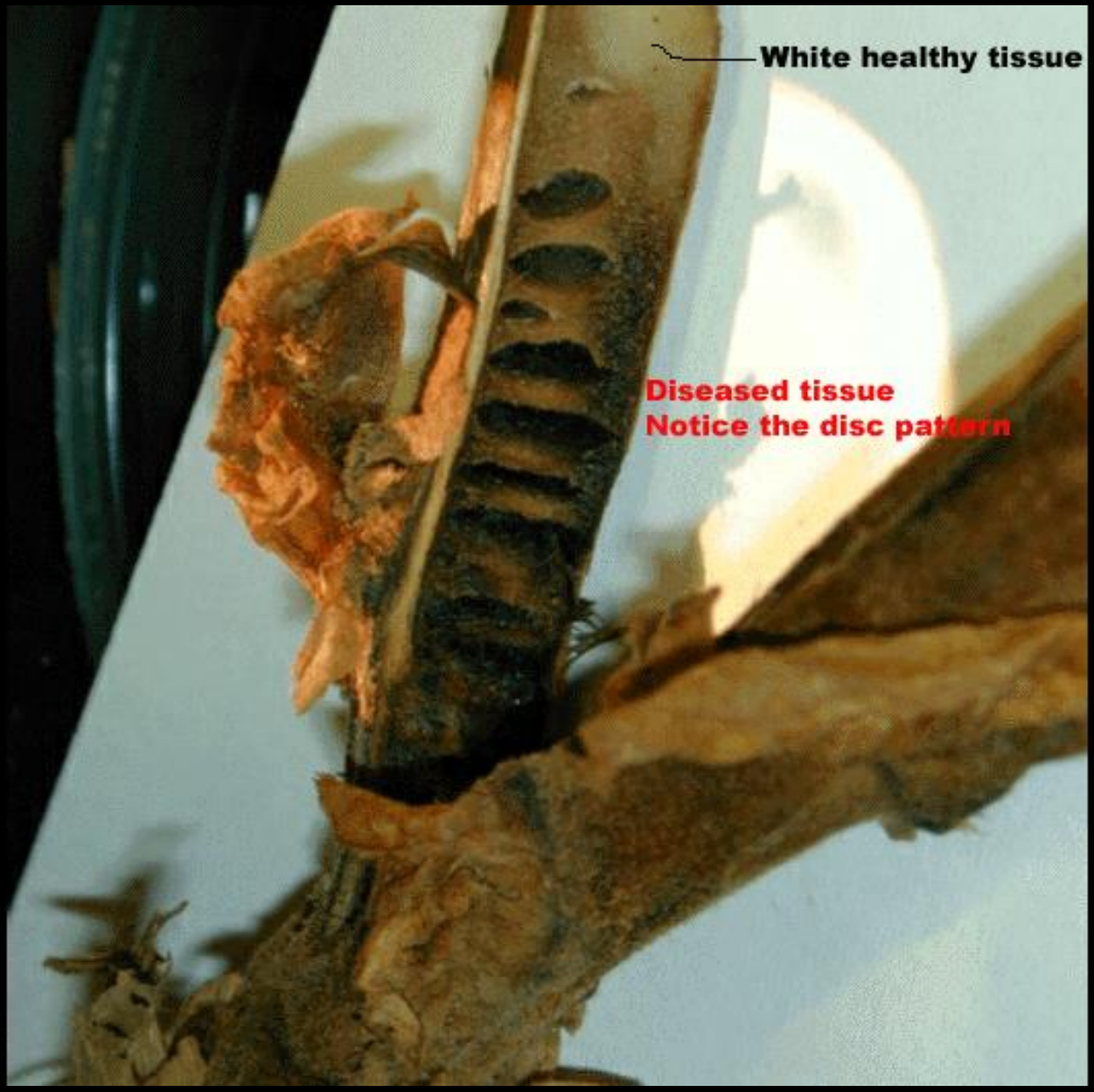
Diseased plants may be randomly distributed in the field or large areas of dying plants may be present.

Black shank is more severe in wetter or poorly drained portions of the field

Black shank

Leaf symptom

Black shank Necrotic pith


White healthy tissue
Diseased tissue
Notice the disc pattern

Black shank infected field

Pathogen

Mycelium non-septate and hyaline

Sporangia are oval, lemon-shaped or pyriform, hyaline and produced sympodially

Germinate directly and produce zoospores which are biflagellate

Chlamydospores – hyaline to brown, globose

Oospores hyaline to straw coloured, spherical

Spread

Soil-borne and infected plant debris

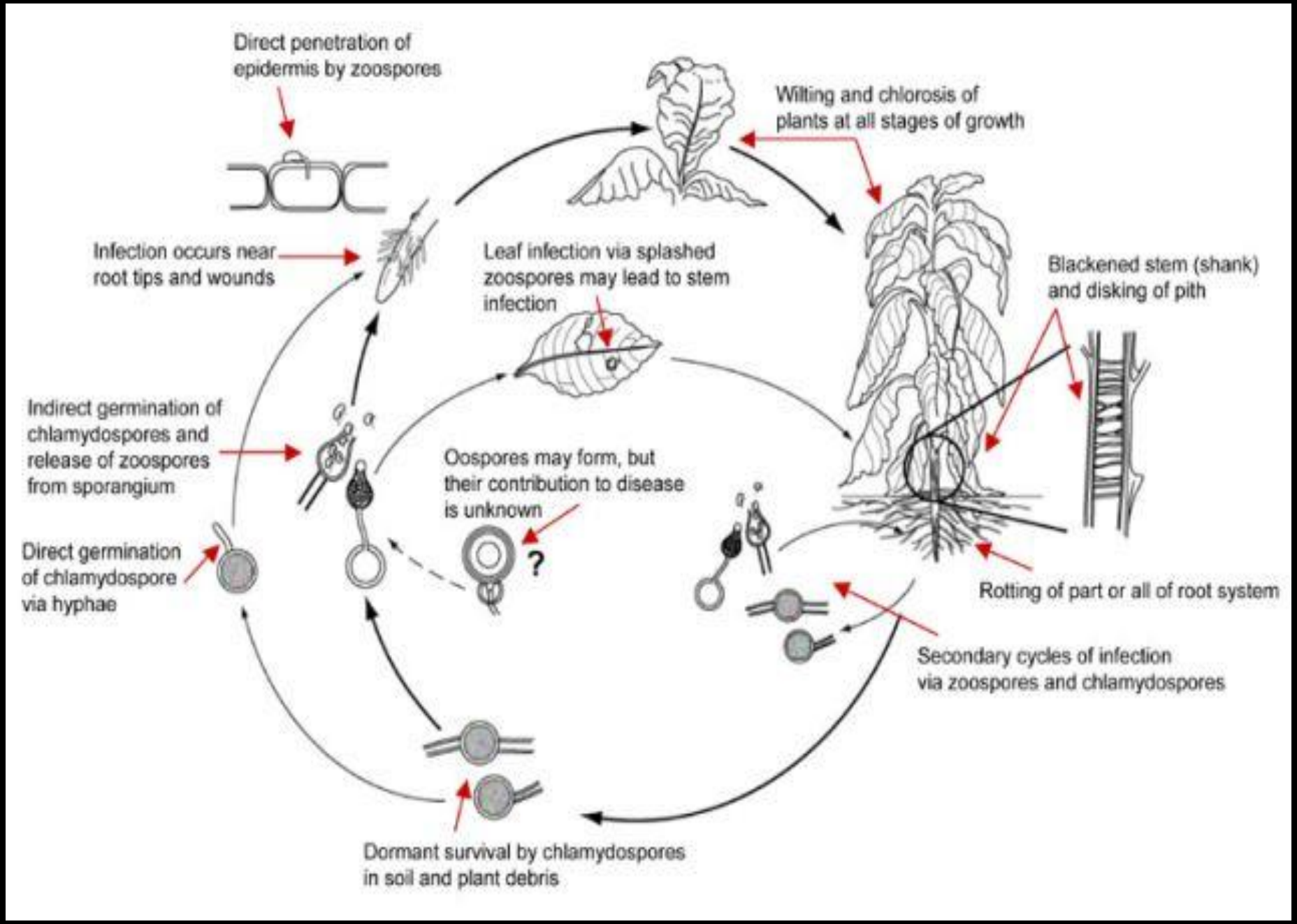
Sec. spread by wind-borne sporangia, rain and irrigation water

Favourable condition

High moisture and temp between 16 and 30^{o}C

Heavy soil and incidence of root knot nematode,

Meloidogyne incognita and *M. javanica*


Direct penetration of epidermis by zoospores
Wilting and chlorosis of plants at all stages of growth
Infection occurs near root tips and wounds
Leaf infection via splashed zoospores may lead to stem infection
Blackened stem (shank) and disking of pith
Indirect germination of chlamydospores and release of zoospores from sporangium
Oospores may form, but their contribution to disease is unknown
?
Direct germination of chlamydospore via hyphae
Rotting of part or all of root system
Secondary cycles of infection via zoospores and chlamydospores
Dormant survival by chlamydospores in soil and plant debris

Management

Burn seed bed with paddy husk or groundnut shell @ 15-20 cm thick layer

Provision of adequate drainage

Drench 1.0 % Bordeaux mixture or 0.2 % copper oxychloride

Spray the bed after two weeks with 0.2 % metalaxyl or 0.2 % copper oxychloride or 1.0 % Bordeaux mixture

Southern blight or stem and root rot - *Sclerotium rolfsii*

- Brown, sunken lesions on the stem near soil line
- Leaves turn yellow, wilt and dry
- Root rots when the plants are dead
- Mustard seed like sclerotia found on diseased stem lesions

Anthracnose ~ *Colletotrichum tabacum*

Symptoms

- Initially, infection starts on lower leaves as pale-brown circular spots with papery depressed centers outlined by slightly raised brown margin.
- The leaf-spots may remain small with white areas in the centre or coalesce to form large necrotic lesions.
- Under continuous humid weather, dark brown or black, elongated, sunken necrotic lesions appear on midrib, petiole and stem resulting in petiole and stem rot. Such seedlings do not establish in the field if planted.
- Primary infection starts from affected bits of aerial parts left in the soil in the previous season.
- The pathogen is not seed-borne but persists in the soil on dried plant debris.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Management

- Raised seed beds and rabbing with farm wastes help in reducing the initial infection
- Removal and destruction of all diseased debris minimizes the pathogen in the soil.
- Rouging diseased seedlings especially with necrotic lesions on stem
- Protective spraying with Bordeaux mixture at 1.0% (2-2-500) or Zineb @ 2 kg/ha

Brown Spot (*AIternaria longipes*)

Brown, circular spots with concentric rings can be seen on foliage

These may coalesce forming irregular areas on the foliage.

Disease severity is positively correlated with cloudy, wet weather.

The disease occurs primarily on mature leaves often beginning on the lower leaves and progressing to other leaves higher up on the stalk.

Frog-eye spot (*Cercospora nicotianae*)

Small reddish circular spots appear on lower leaves which later become bigger in size and develop ashy white or pale brown centre surrounded by brown bands and it looks like frog-eye.

Size varies from 5-15 mm

Spots also formed on bracts, calyx and capsules (Externally seed-borne)

Frog eye spots appear mainly on the lower leaves.

They are usually **circular, brown or tan with dark-brown and pale ashy or white parchment like centre** resembling frog's eye at early stages .


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Target spot / Sore shin caused by *R. solani*

Water soaked lesion with 2-3 mm dia

Under humid conditions, lesions are light green with chlorotic halo

Spots become necrotic and sometimes produce shot-hole symptom

Dark brown lesions on stem near soil line

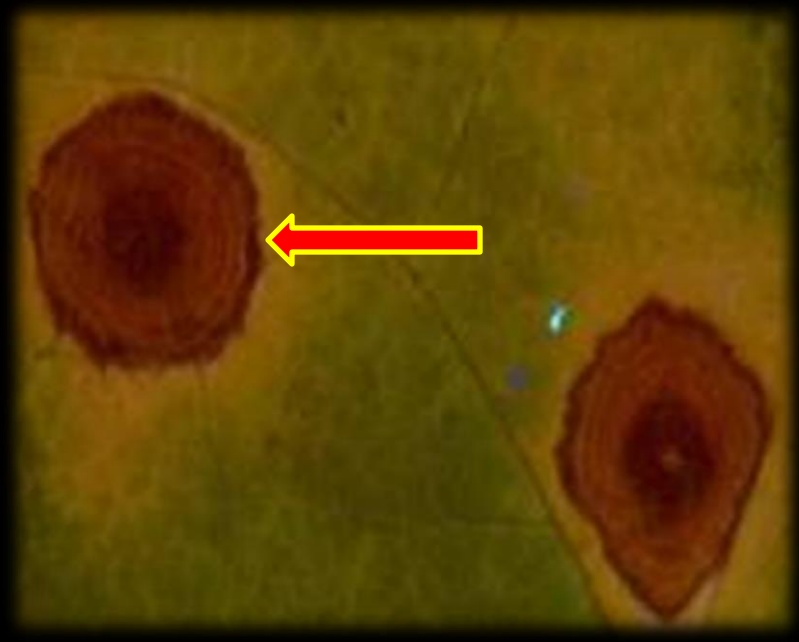
Lesions enlarge girdle and cause rotting of stem

Affected plant break down at the diseased portion in the stem

Brown spot - *Alternaria longipes*

Symptoms

- Brown spot in contrast to frog-eye spot is not normally observed in the nursery but is very much prevalent in the field. Initially it appears small brown, circular lesions, which spread to upper leaves, petioles, stalks and capsules.,
- In severe infection spots enlarge, coalesce and damage large areas making leaf dark-brown, ragged and worthless. On leaves nearing maturity, leaf spots are surrounded by bright yellow halo, due to production of toxin 'alternin' by the fungus.



leaf spots are surrounded by bright yellow hal

Brown Spot: ***Alternaria longipes, Alternaria tenuis, Alternaria alternata***

Management

- Removal and destruction of diseased plant debris.
- Continuous growing of tobacco after tobacco must be avoided in the heavily infected fields.
- Weekly, spraying of fungicides such as Maneb or Zineb @ 2g/ha or Benomyl or Thiophanate methyl at 1kg/ha.

Powdery mildew - *Erysiphe cichoracearum* var. *nicotianae*

Symptoms

- Initially the disease appears as small, white isolated patches on the upper surface of the leaves. Later, it spreads fast and covers the entire lamina.

- Sometimes powdery growth can be seen on the stem also. The affected leaves turn to brown and wither and show scorched appearance.

- The severe infection leads to defoliation and reduction in quantity and quality of the curable leaves.

Pathogen

- The fungus is ecotophytic and produces hyaline, septate and highly branched mycelium.
- Short, stout and hyaline conidiophores arise from the mycelium and bear conidia in chains. The conidia are barrel shaped or cylindrical, hyaline and thin walled.
- Cleistothecia are black, spherical with no ostiole, with numerous densely-woven septate, brown-coloured appendages. They contain 10-15 asci which are ovate with a short stalk.
- Each ascus contains two ascospores which are oval to elliptical, thinwalled, hyaline and single celled.

Favourable Conditions

- Humid cloudy weather.
- Low temperature (16-23˚C).
- Close planting and excess doses of nitrogenous fertilizers.

Mode of spread

- The fungus remains dormant as mycelium and cleistothecia in the infected plant debris in soil.
- The primary infection is mainly from soil-borne inoculum.
- The secondary spread is aided by wind blown conidia.

Management

- Apply balanced ferilizers.
- Avoid overcrowding of plants.
- Remove and destroy the affected leaves.
- Plant early in the season so that crop escapes the cool temperature at maturity phase.
- Spray dinocap at 375 ml or Carbendazim at 500g/ha.

Black root rot	- *Thielaviopsis basicola*
Charcoal rot	- *Macrophomina phaseolina*
Collar rot	- *Sclerotinia sclerotiorum*
Verticillium wilt	- *Verticillium albo-atrum, V. dahliae*
Blue mold (Downy mildew)	- *Peronospora tabacina*
Grey mold	- *Botrytis cinerea*

Angular leaf Spot or wild fire (*Pseudomonas angulata*, *P. tabaci)*
Angular leaf spot is more prevalent during warm, wet weather.
Small, dark brown spots will develop over the leaf surface.
Angular spots will be deliniated by the small leaf veins.

P. angulata is a non toxin forming mutant of *P. tabaci*, which produces a toxin called tabtoxin. Morphologically both are similar.

Non-capsulated, non-spore forming, Gram negative and rod-shaped.

Bacterial wilt (*Ralstonia solanacearum)*
Wilt symptoms produced are similar to those caused by black shank.
The leaves do not yellow, but wilt suddenly.
Discolored tissue will be evident beneath the outer layer of the stem.
The central portion of the stem will be darkened but not divided into disks as with black shank.
Bacterial streaming from cut ends when dipped in water

Hollow stalk /Hollow shank – *Erwinia carotovora* subsp. *carotovora*

Dark brown to black spots

Wild fire

Water soaked black spots later angular

Enlarged spots with yellow haloes

Tobacco Mosaic Virus

Symptoms

Causes varying degrees of damage depending on earliness of infection.

Symptoms include a general mottling of the leaves with irregular light and dark green splotches over the leaf surface.

Expanding bud leaves may be distorted, narrow and crinkled in appearance.

Dark green blisters and enations (leafy growth) appear on lower leaf surface

Sometime necrotic brown spots or scorched patches appear on leaves resulting in mosaic scorch or mosaic burn under hot sunny dry periods.

Growth is retarded. Leaves are narrowed, puckered, dostorted, thin and malformed. It lowers the market value of leaves

Partial sterility of infected plants

Cont.,

First the leaf margins curl downward towards the dorsal side and show thickening of veins with enation on the lower surface.

Second crinkle form shows curling of whole leaf edge towards dorsal side with enation on the veins and the lamina arching towards the ventral side between the veinlets.

Third the transparent symptom shows the curling of leaves towards the ventral side with clearing of the veins and enations are absent.

Tobacco Mosaic Virus

Mosaic symptoms on tobacco leaves

Vein banding by TMV

Mosaic burn on lower leaves of tobacco by TMV

Tobacco plant infected with TMV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Causal agent: Nicotiana virus or Marmor tabaci

Virus is hollow, rod shaped particle, ss RNA

Mode of spread: Sap transmissible; enters through wounds

Mechanical means by wind, water, farm workers in the field

Cultural practices like topping or clipping

Management

Roguing

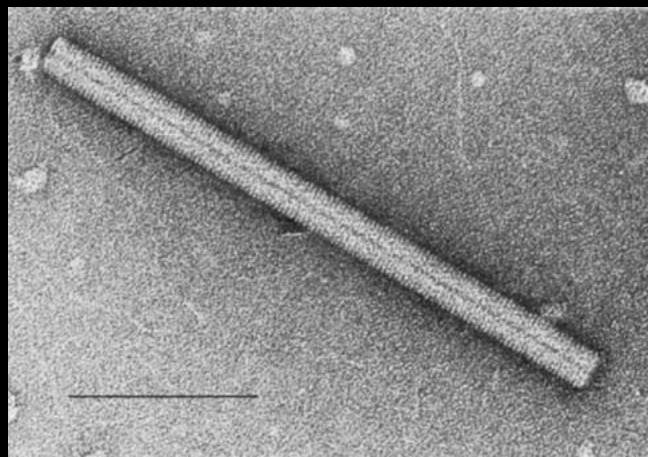
Free from weeds

Wash hands with soap water before and after field operation

Crop rotation

Use resistant varieties

Spray *Bougainvillea / Basella alba* leaf extract



Tobacco leaf curl - Tobacco leaf curl virus

Dwarfing of plant
Reduction in leaf size, curling of whole or portion of leaf blade, thickening and greening of veins with vein clearing symptoms
Enation – leaf like outgrowth along the veins on lower leaf surface is common
Inflorescence is greatly condensed and veins of calyx are green and thickened
Virus is transmitted by white fly, *Bemisia tabaci*

Tobacco necrosis - Tobacco necrosis virus
Tobacco rattle - Tobacco rattle virus
Tobacco ring spot - Tobacco ring spot virus
Tobacco streak - Tobacco streak virus

Leaf Curl : ***Tobacco leaf curl virus***

The most characteristic symptom of tobacco leaf-curl disease is the production of leafy outgrowths known as enations from the veins on the lower surface of the leaves.

Combined with this, is a stunting of the whole plant and twisting and curling of the leaves.

Broom rape – *Orobanche cernua* var. *desertorum* and *O. indica*
(Phanerogamic parasite - Total root parasite)

Symptoms

Wilting, drooping and ribbing of leaves are seen in early hours

Young parasitic plants emerge from soil at the base of tobacco plants

Plants attacked early show general stunting and wilting

Plants attacked late in season do not show visible symptoms but yield and quality of leaves are reduced.

Parasite

Very frequently 10-15 Orobanche shoots found attached to the roots of a single plant Emerges in clusters, pale brown or purple, 15-45 cm tall.

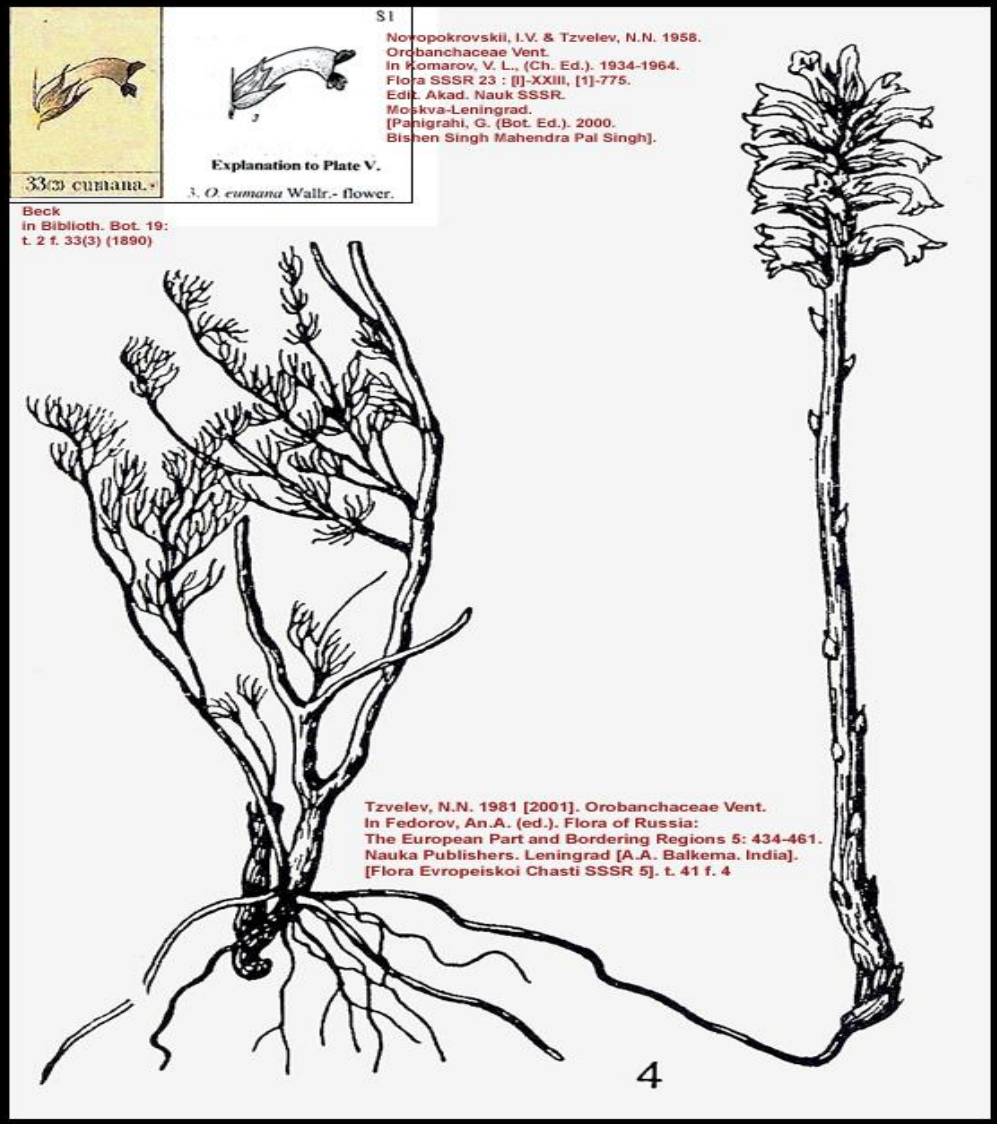
Stem solitary round and thickened at the base

Flowers are long and curved; Fruit is a capsule contain many oval brown seeds

Mode of spread: Seeds in soil and sec. spread through irrigation water, animals, human beings and implements

Other crops: Brinjal, Tomato, Cauliflower, Turnip and other cruciferous plants

Young shoot of the parasite emerges from the soil at the base of the plants



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Management

Sowing clean seeds of tobacco

Rouging (by regular weeding)

Spray soil with 25 % Copper sulphate

Spray drenching the emerged shoot with 0.1 % allyl alcohol (tender shoot stage)

0.2 % at later stages

Apply few (3-4) drops of kerosene directly on shoot

Grow trap crops like chillies, mothbean, sorghum, cowpea in rotation to stimulate seed germination and kill the parasite

Application of (2-3 drops of) sunflower, linseed, castor, safflower, neem oil on young shoots, which will kill the parasite

Thank you